

From limited observation, he was of opinion that in a wind veering from north to south, following the sun geese as well as ducks fly very high. Other winds bring them low. In an endeavour to collect further information on this point we corresponded with various members of the Society. The note published above is from Major R. Hingston. We welcome comments from other observers. EDS.]

XXIII.—THE SURVIVAL OF THE GAVIAL (*GAVIALIS GANGETICUS*) IN BURMA

(With 3 text figures).

Mr. Barton's note (*Journ. Bomb. Nat. Hist. Soc.*, vol. xxxiii, No. 2, p. 450) recording a specimen of the Indian Gharial shot in Upper Burma is most interesting. I would like to comment however upon one of his remarks. He says 'the fact of its being killed in the Shweli, well over a thousand miles from the delta of the Irrawadi, is of great interest'. Does Mr. Barton mean that the Indian Gharial was originally a deltaic or estuarine species and that it gradually extended its range up the Irrawadi as far as the Shweli. There is nothing in the past history or in our present knowledge of the creature to suggest such a theory.

The *Gavialidae* are an ancient family, and were at one time, much more widely distributed than they are to-day. During the Tertiary epoch they ranged over Asia, North America and Europe. Of this great host only two species now survive, namely, *Gavialis gangeticus*, the Indian Gharial and *Tomistoma schlegeli*, the Malayan Gharial. The genus *Gavialis* flourished in India during the Pliocene period. Lydekker has described no less than five fossil forms from the Siwalik hills and the Narbudda valley, one of which is indistinguishable, as far as we can tell, from the *Gavialis gangeticus* which exists to-day. In considering the distribution of this ancient reptile therefore, probably the oldest of all the living Crocodilia, we must remember that it dates back to a time when the geographical configuration and the river systems of the country were no doubt very different from what they are to-day. Those that we see now are the survivors of a former wider distribution. The fact that they have escaped notice on the Irrawadi for so long is because only a few individuals are left there.

While on the subject of crocodiles I should be glad if any reader of this Journal can tell me of an authentic record of the Mugger, *Crocodilus palustris*, in Burma. Its distribution is given by Boulenger, in the *Fauna of British India*, as India, Ceylon, Burma, the Malay Peninsula and Archipelago (Java). This I showed in 1919 (*Journ. Nat. Hist. Soc. Siam*, iii, p. 220) is not correct. The fresh-water crocodile of Siam, French Indo-China and the northern part of the Malay Peninsula (Patani) is *C. siamensis*, while the most easterly record of the Mugger is from the Brahmaputra, Darrang district, Assam (Annandale, *Rec. Ind. Mus.*, viii, 1912, p. 38). I do not know of any authentic statement or specimen to shew that it

exists in Burma or anywhere outside the Indian region. If it does live in Burma it is probably north of lat. 17° N. The fresh-water crocodile of Tenasserim, if there is one, is almost certainly *C. siamensis*, which is common on the Quaa Noi river, just across the border, north of Tavoy. It is unlikely that two closely allied species will be found living side by side.

Three species of crocodile inhabit Asia, namely *C. palustris*, the Mugger, *C. siamensis*, the Siamese Crocodile and *C. porosus*, the Estuarine Crocodile. The first two are, I believe, strictly fresh-water species, the third equally strictly estuarine and marine in its habitat. Any records of the Indian Mugger in estuarine waters are probably wrong identifications. Occasional individuals, particularly youngsters, may get carried down to the mouths of rivers, but they are exceptions.

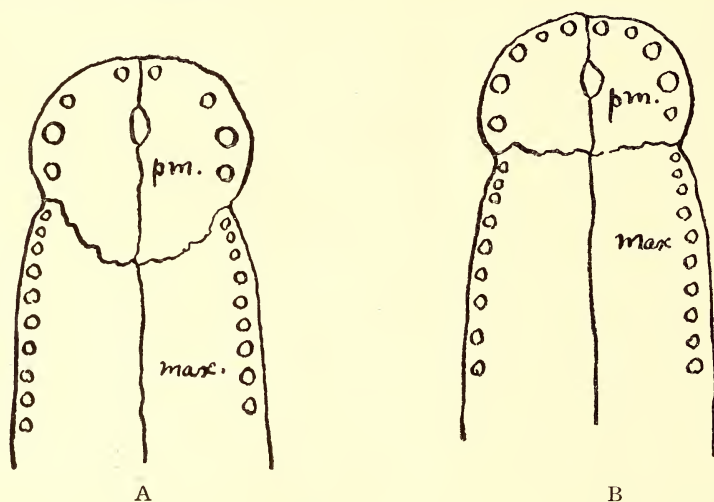


Fig. 1. A. Palate of *Crocodilus porosus* and *siamensis*.
B. Palate of *Crocodilus palustris*.

The three species are quite distinct, and if careful attention is paid to the following characters can be readily distinguished from one another. Externally they all look much alike until fully grown, when the different proportions of the snout are a fair guide.

- I. Four teeth in each premaxillary bone in the adult; premaxillo-maxillary suture curved backwards or W-shaped; a more or less strong ridge extending forwards in front of each eye. (Fig. 1 A.)

Snout $1\frac{2}{3}$ to $2\frac{1}{6}$ times as long as broad at the base; bony portions of the dorsal scutes separated from each other by soft skin; post-occipital scutes usually absent (Fig. 2) *porosus*.

Snout $1\frac{2}{3}$ to $1\frac{5}{8}$ times as long as broad at the base ; bony portions of the dorsal scutes in contact with one another in a transverse series ; one or two pairs of post-occipital scutes (Figs. 1 A & 3) ... *siamensis*.

- II. Five teeth in each maxillary bone in the adult ; premaxillo-maxillary suture directed more or less straight across the palate ; bony portions of the dorsal scutes in contact with one another in a transverse series ; snout $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as broad at the base, without distinct ridges (Figs. 1 B & 3) ... *palustris*.

The premaxillo-maxillary suture can be seen by lifting up the membrane covering the bone inside the mouth ; the outlines of the

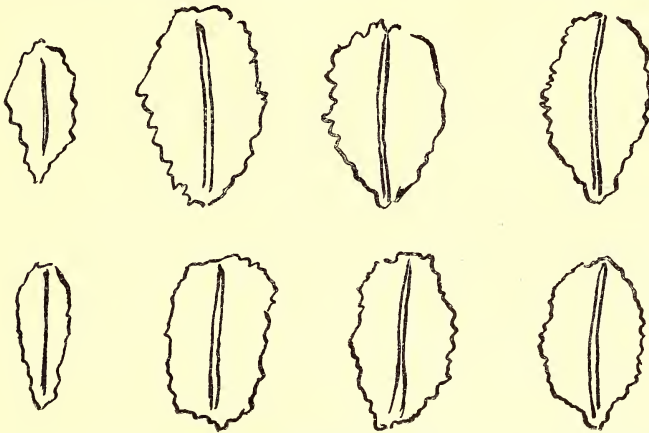


Fig. 2. Dorsal armour of *Crocodilus porosus*. The horny external skin has been removed.

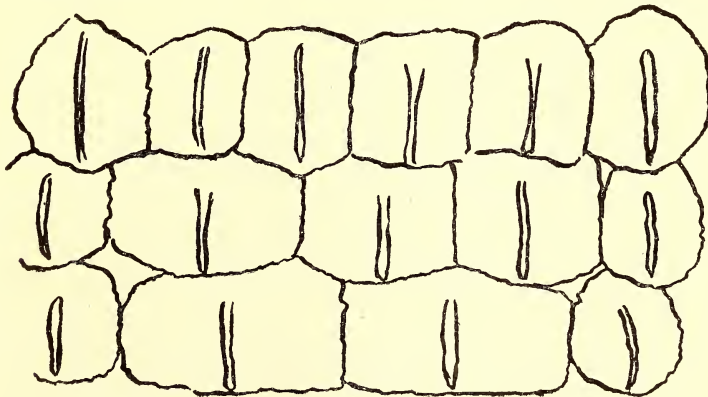


Fig. 3. Dorsal armour of *C. palustris* and *siamensis*. The horny external skin removed.

bony portions of the dorsal scutes can be seen externally or better still by removing the horny cuticle which covers them ; or when the skin is removed can be seen by transmitted light.

Since writing the above I have seen a note by Theobald of a specimen of *C. palustris* killed at Thayetmyo, on the Irrawadi (*J. Linn. Soc., Zool.*, x, 1868, p. 20). It was a full-grown specimen, 12 feet long, and had recently killed a man. He remarks that *C. palustris* is evidently very rare in Burma, as it is the only example he has ever seen.

Later in 1882 he wrote of *C. palustris* 'rare in Burma, but is found inland about Thayetmyo, and thence up the Irrawadi' (*Burma, Its People and Productions*, p. 335). Although in his writings Theobald confused *palustris* with *porosus* there can be little doubt, from the locality in which it was found, that the crocodile to which he refers was not *porosus*.

LONDON,
April 10, 1929.

MALCOLM SMITH.

XXIV.—NOTE ON A FORMOSAN VIPER (*TRIMERESURUS MUCROSQUAMATUS*) FROM THE NORTH-EAST FRONTIER

The Society recently received a fine example of a Formosan Viper (*Trimeresurus mucrosquamatus*) from Mr. J. N. Saikia, Medical Officer, Pasighat, N.-E. Frontier. The snake agrees with descriptions of Formosan specimens given by Boulenger in the *Fauna*, Brit. India, *Reptilia*. The costals are 23, two head lengths behind the head, and 25 in mid-body. Ventrals 200, Sub-caudals in 73 pairs. Length 3' 7". The colouration differs in that the lower parts are yellowish grey with irregular square-shaped white markings.

BOMBAY NATURAL
HISTORY SOCIETY,
April 15, 1929.

S. H. PRATER,
C.M.Z.S.

XXV.—RECORD OF SYMPTOMS AND TREATMENT OF A BITE FROM A FORMOSAN VIPER (*TRIMERESURUS MUCROSQUAMATUS*)

A forest cooly was bitten by the above named viper on the inner side of the left foot at about 3-30 P.M., on the evening of the April 10, 1929. The man walked 3½ miles to the hospital where he was admitted at about 6 P.M.

He complained of pain at the site of the bite and all over the limb and in the inguinal gland of the affected limb. The whole limb and the gland were swollen to about twice the size of the corresponding limb.

On examination (with a lens and naked eye as well) one puncture mark was noticed on the inner side of the left foot about midway